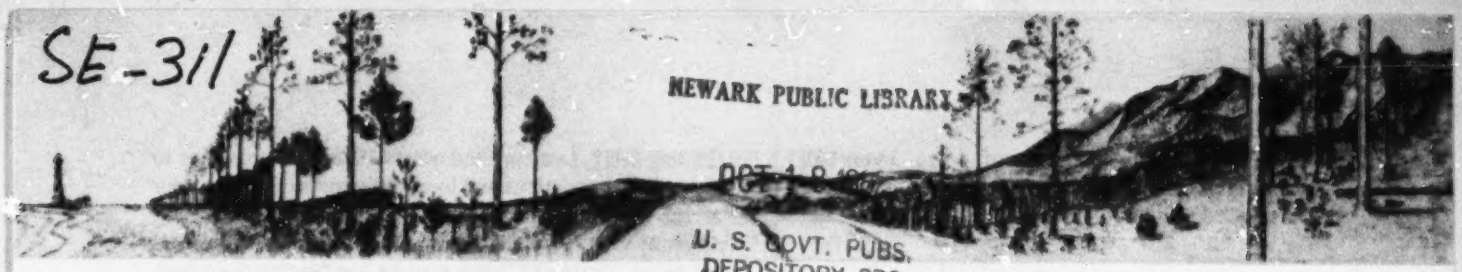

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PINE TIP MOTH DAMAGE IN RELATION TO SITE PREPARATION AND REGENERATION METHOD FOR LOBLOLLY PINE

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ABSTRACT.—In the Georgia Piedmont, tip moth incidence was measured in loblolly pine regenerated in three ways: row planted, row seeded, and broadcast seeded. The plots were site prepared by burning or roller chopping. Data taken for the 1st 3 years showed that damage was greatest in the planted trees. Damage increased from the 1st to the 2nd year and leveled off or declined the 3rd year. The least damage associated with site preparation occurred on the plots which had been burned, but the amount of variation was high and differences were nearly gone by the end of the 3rd year.

Keywords: *Rhyacionia* spp, direct seeded, planted.

The pine tip moth group (*Rhyacionia* spp.) contains a number of species injurious to southern pines. Injury in the form of shoot and tip dieback, crown reduction, and stem deformation during the first years of growth may be sufficient to require some form of protection. Severity of attack is influenced by several factors, including the moth species and regional or local variables acting on the trees. One possibly important local variable is stand management, especially site preparation. Hertel and Benjamin (1977) reported differences in tip moth incidence related to site preparation in Florida. Severity of attack appeared to increase with intensity of site preparation. Because of the high costs of site preparation, any possible negative effects which offset the advantages should be identified and assessed. Among the objectives of this study was to determine incidence of tip moths in planted or direct-seeded loblolly pine (*Pinus taeda* L.) on mechanically prepared and prescription-burned sites in the lower Piedmont of Georgia.

METHODS AND MATERIALS

Prescribed burning and roller chopping were used for site preparation following the harvest of six mixed pine-hardwood areas distributed through the lower Piedmont of Georgia. At each site, a pair of 6-acre adjacent blocks was selected for treatment. The roller cutter was used in midsummer to double chop one block, and a prescribed burn was carried out during the growing season on the other. Within each block, three regeneration methods were used: (1) broadcast seeding, 1 lb/acre plots 1 to 4, 1.5 lb/acre plots 5 to 6 (19,500 seed/lb); (2) row seeding in furrows (100–400 seed/100 feet of row approximately 10 feet apart); and (3) hand planting on a 6- by 8-foot spacing. Two pairs of blocks were planted and direct seeded in February or March in 1968, 1969, and 1970.

Tip moth evidence was tallied at the end of the first three growing seasons, except in two sites which were not examined the 1st year. All seedlings in five randomly selected rows of planted seedlings were examined. The same rows were sampled each year. In the seeded plots, all seedlings were examined in 10 systematically located milacre quadrats along each of five randomly selected transects through each seeded subplot. Trees were classified and tallied for infestation status based on the presence or absence of tip moth damage in the leader or terminal bud cluster. Infestation levels were expressed as percentage of infested trees on which an arc sine square root transformation was used for ANOVA and Duncan's multiple range test. At the end of 1972, the percentage of partial or complete overtopping by competing vegetation was obtained in all plots or rows where tip moth infestation was measured.

RESULTS

The relationship between tip moth attack and regeneration method is given in table 1; the F values for the variables of interest are shown in table 2. The results show that the incidence of tip moth in the planted pines was significantly different (greater) for all 3 years, increasing in the 2nd year and declining in the 3rd. Incidence of damage among the planted seedlings at the end of the 1st year in relation to site preparation ranged from 1 to 44 percent in the individual blocks, with the highest percentage occurring on the plots prepared by roller chopping and the

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Table 1.–Number and percentage of 1- to 3-year-old* loblolly pines tip moth infested in relation to regeneration method at six Georgia Piedmont sites

Regeneration method	1st year		2nd year		3rd year	
	No.	%	No.	%	No.	%
Row seeded	243	0	1,037	2.9	995	10.9
Broadcast seeded	340	0	718	6.3	652	15.3
Planted	674	16.9	1,021	28.4	963	19.9

*Age = Number of completed field growing seasons at time of examination.

Table 2.–Significance of site preparation and regeneration method in pine tip moth incidence

Variable	1st year	2nd year	3rd year
	..... *F value*		
Block	2.31	2.15	1.60
Site treatment	2.52	.38	.24
Regeneration method	28.40*	31.93*	2.74*
Site treatment X regeneration method	2.52	.26	1.17

*Significant at $P = 0.10$.

lowest on those which had been burned. When the percentages of 1st-year tip moth incidence in the individual plots were pooled, there was 22 percent damage on the roller-chopped plots vs. 9.8 percent on the burned plots. The differences in tip moth incidence in planted pines in relation to site preparation declined the 2nd year and were virtually gone by the end of the 3rd year.

Injury began to appear in the seeded treatments by the end of the second growing season, and increased in the 3rd year.

The combination of row-seeded pines in the blocks which had been prescribe burned showed the least incidence of tip moth infestation.

Differences related to block effect were not significant.

DISCUSSION

The pattern of infestation by age of planted seedlings, i.e., relatively light infestation the 1st year building up to a high level the 2nd year, and leveling off or declining the 3rd year, has been observed elsewhere (Henry 1959; Henry and Hepting 1957; Lashomb and others 1978). However, due to geographical variations and local differences in the behavior of tip moth populations, the pattern in the first 3 years may not always follow this trend. But if control measures are being considered, there may be justification for scheduling tip moth treatment at the beginning of year 2 to obtain the greatest benefit.

As to the effects of site preparation, the reason for less tip moth damage in the blocks which had been prescription burned is not known. Only 1 year's data were available comparing the amount of competing vegetation and this showed large variations between blocks. The effect of vegetation on tip moth incidence has often been reported. Warren (1965) suggested that the vegetation inhibits free flight of the moths and subsequent infestation. In a study in Texas, Stransky reported more tip moth damage in 5-year-old loblolly pine plots site prepared by burning than in the control or chopped plots.[2] Further study is needed to determine the effect of site preparation on tip moth damage. Since the costs of site preparation by chopping are substantially higher than for prescribed burning (Moak and others 1980), it would be important to determine if additional tip moth injury occurs when chopping is used.

The results of this study indicate that initial tip moth damage is much lower when regeneration is by direct seeding. It is important to emphasize, however, that these results compare direct seeding with planting. Since the trees and seed in the present study were of the same stock (GK-11), susceptibility to tip moth attack would be the same for the planted vs. the seeded pines except for the influence of vegetation. Then seedling height in relation to other vegetation present would become a factor. As the data for the seeded trees show, tip moth incidence begins to increase as the trees become older, probably because they are no longer protected by competing vegetation.

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